

POSTER PRESENTATION

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Right ventricular remodeling and dysfunction among the spectrum of heart failure phenotypes

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From 19th Annual SCMR Scientific Sessions
Los Angeles, CA, USA. 27-30 January 2016

Background

Right ventricular dysfunction (RVD) and enlargement (RVE) are increasingly associated with poor outcomes however their prevalence among patients with heart failure and those at risk has not been well characterized.

Methods

Healthy controls and patients with heart failure related structural heart disease underwent a standard cardiac magnetic resonance examination. Right and left ventricular ejection fraction (EF) and end diastolic volumes (EDV) were traced from cine imaging. RVD was defined as RVEF less than mean minus 2 standard deviations of healthy gender matched controls. RVE was defined as either indexed RVEDV or RVEDV/LVEDV exceeding mean plus 2 standard deviations of healthy gender matched controls. The prevalence of RV abnormalities and pattern of ventricular remodeling was compared among patient subgroups.

Results

89 healthy controls, age 57 ± 10 years, and 502 patients, age 56 ± 16 years, were included. Among controls, RVEF was $61 \pm 6\%$ for women and $60 \pm 5.6\%$ for men, $p = 0.5$, indexed RVEDV was $63 \pm 11 \text{ mL/m}^2$ for women and $71 \pm 12 \text{ mL/m}^2$ for men, $p < 0.05$, and mean RVEDV/LVEDV was 0.94 ± 0.12 for women and 0.98 ± 0.14 for men, $p = 0.19$. Among patients, RVD was detected in 47%, RVE in 38% and either RV abnormality in 61%. RV abnormalities were common in all patient subgroups, ranging from 31% in hypertensive heart disease to 100% in right sided valvular heart disease.

Conclusions

RV dysfunction and/or enlargement are prevalent among patients with heart failure related structural heart disease. Routine assessment is therefore recommended in 3-D cardiac imaging.

Table 1. Baseline Characteristics and CMR Measures in 89 Healthy Controls

	All (N = 89)	Female (N = 42)	Male (N = 47)	p-value*
Age at Exam (yrs)	57 ± 10	59 ± 9	55 ± 11	0.11
BSA (m ²)	1.9 ± 0.2	1.8 ± 0.2	2.0 ± 0.2	< 0.001
Systolic Blood Pressure (mmHg)	130 ± 15	129 ± 16	131 ± 14	0.59
Diastolic Blood Pressure (mmHg)	77 ± 9	74 ± 8	81 ± 9	< 0.001
Heart Rate (bpm)	68 ± 10	67 ± 11	68 ± 9	0.61
LVSV (ml)	83 ± 16	74 ± 13	92 ± 15	< 0.001
Indexed LVSV (ml/m ²)	43 ± 6	41 ± 5	45 ± 7	0.002
LVEF (%)	62 ± 4	62 ± 4	62 ± 4	0.988
LVEDV (ml)	135 ± 28	119 ± 19	148 ± 27	< 0.001
Indexed LVEDV (ml/m ²)	70 ± 10	66 ± 7	73 ± 11	0.001
LVESV (ml)	51 ± 13	45 ± 8	57 ± 14	< 0.001
Indexed LVESV (ml/m ²)	27 ± 5	25 ± 4	28 ± 6	0.014
LV mass (g)	102 ± 26	83 ± 13	119 ± 22	< 0.001
Indexed LV mass (g/m ²)	53 ± 9	46 ± 6	58 ± 8	< 0.001
RVSV (ml)	78 ± 17	69 ± 14	85 ± 15	< 0.001
Indexed RVSV (ml/m ²)	40 ± 7	38 ± 7	42 ± 7	0.011
RVEF (%)	60 ± 6	61 ± 6	60 ± 6	0.50
RVEDV (ml)	129 ± 30	113 ± 24	144 ± 27	< 0.001
Indexed RVEDV (ml/m ²)	67 ± 12	63 ± 11	71 ± 12	0.001
RVESV (ml)	52 ± 16	45 ± 12	58 ± 16	< 0.001
Indexed RVESV (ml/m ²)	27 ± 7	25 ± 6	29 ± 7	0.007
LVmass/LVEDV (g/ml)	0.76 ± 0.11	0.70 ± 0.08	0.81 ± 0.10	< 0.001
RVEDV/LVEDV	0.96 ± 0.13	0.94 ± 0.12	0.98 ± 0.14	0.19

Figure 1 All values are given as mean +/- standard deviation except for number of subjects. * p-value of comparison between male and female healthy controls

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Table 3. Demographics and Cardiac MR Measures by Disease Group										
Disease Group	HTN	HFPEF	Infiltrative	Dilated	Ischemic	Myocarditis	Valvular (L)	Valvular (R)	PH	All
Number (male)	64 (36)	22(17)	25(19)	127 (90)	81(70)	79(57)	33(9)	15(5)	56(19)	502(325)
Age (yrs)	63 ± 12*	75 ± 7*	54 ± 14	53 ± 14*	69 ± 13*	42 ± 14*	61 ± 19	53 ± 19	57 ± 16	56 ± 16
LVEF (%)	61 ± 8	56 ± 7*	59 ± 14	32 ± 14*	32 ± 12*	49 ± 14*	55 ± 12*	60 ± 11	62 ± 8	47 ± 17
Indexed LV mass (g/m ²)	65 ± 13	66 ± 13	64 ± 32	67 ± 24	63 ± 23	66 ± 28	73 ± 25*	49 ± 13	57 ± 16	74 ± 23
Indexed LVEDV (mL/m ²)	63 ± 15	69 ± 17	60 ± 23	129 ± 39	112 ± 44	69 ± 37	104 ± 44	64 ± 15	62 ± 16	97 ± 43
LVM/LVEDV (g/mL)	1.06 ± 0.19	1.04 ± 0.29	1.05 ± 0.25	0.69 ± 0.15	0.74 ± 0.16	0.8 ± 0.2	0.75 ± 0.22	0.79 ± 0.2	0.95 ± 0.23	0.83 ± 0.24
RVEF (%)	56 ± 8	53 ± 8	52 ± 14	41 ± 14	46 ± 14	49 ± 11	53 ± 12	56 ± 8	41 ± 12	47 ± 13
Indexed RVEDV (mL/m ²)	63 ± 14	72 ± 21	77 ± 17	92 ± 30	80 ± 28	65 ± 26	80 ± 26	108 ± 33	103 ± 32	65 ± 29
RVEDV/LVEDV	1.01 ± 0.15	1.06 ± 0.24	1.01 ± 0.26	0.74 ± 0.23	0.79 ± 0.39	0.99 ± 0.24	0.85 ± 0.32	1.7 ± 0.45	1.76 ± 0.66	0.99 ± 0.47
RVD	12 (19%)	8 (36%)	9 (36%)	64 (66%)	40(49%)	33 (42%)	10(30%)	3 (20%)	39 (66%)	237 (47%)
RVE	9 (14%)	5 (23%)	7 (28%)	52 (41%)	18(22%)	28 (35%)	6 (24%)	15 (100%)	47(64%)	169 (36%)
RVD or RVE	20 (31%)	11 (50%)	11 (44%)	94 (74%)	41(51%)	49 (62%)	14 (42%)	15 (100%)	50 (89%)	305 (61%)

Figure 2 All values are given as mean +/- standard deviation except for number of subjects.

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Published: 27 January 2016

doi:10.1186/1532-429X-18-S1-P73

Cite this article as: Wang et al.: Right ventricular remodeling and dysfunction among the spectrum of heart failure phenotypes. *Journal of Cardiovascular Magnetic Resonance* 2016 18(Suppl 1):P73.

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